

REMARKS

Claims 6-10, 26-28, 31, 32, 35, 36, 38, 42, 44 and 51-55 have been amended to more particularly point out and distinctly claim the invention. The amendments are supported in the specification and the original claims as filed. In particular, in Claims 6, 7, 8, 51, 52 and 53, the phrase "wherein SEQ. ID. NO: 1 is expressed under abiotic stress conditions of 4 °C" and "wherein SEQ. ID. NO: 1 is expressed under abiotic stress conditions of 4 °C in the host cell" have support on page 31, Example 8.11 and Figure 10. In Claim 9 and 54, the phrase "a bacterial cell", has support in the specification at Sections 7.2 – 7.5 on pages 18-19. In Claims 10 and 55, the phrase "a plant cell", has support on page 18, Section 7.3. In Claims 27, 31 and 42, the phrase "substantially amino acid sequence of" has support on page 9, line 31 to page 10, lines 1-13. The phrase "temperatures of 4 °C" have support on page 20, Section 7.6, page 27, page 27, Example 8.6, page 28, Example 8.7, page 31, Example 8.11 and Figure 10. None of the amendments introduces new matter.

The Examiner has objected to Claims 27, 31, 42 and 51-55 for informalities. Applicant appreciates the Examiner's suggestions and has made the appropriate changes and corrections.

1. The Original Claims Particularly Point Out and Distinctly Claim the Subject Matter of the Present Invention

Claims 27, 31 and 42 have been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Applicants submit that this rejection has been obviated because Claims 26, 31 and 42 have been amended to avoid the Examiner's objections. The Examiner states, the phrase, "functionally similar" is confusing since "similar" is a relative term. Applicant has amended these claims to obviate this

rejection by deleting the phrase "functionally similar" and added the phrase "comprising substantially the amino acid sequence". Specifically, these claims have been amended to recite wherein the MAPK5 orthology comprising substantially the amino acid sequence of OsMAPK5 wherein the over-expression of the MAPK5 ortholog in the plant results in increased tolerance to abiotic stress compared to a wild-type plant wherein the abiotic stress consist of temperatures of 4 °C.

The Examiner further states that the phrase "nucleic acid sequence that encodes a MAPK5 ortholog nucleic acid sequence" is confusing. Applicant has amended Claim 31 to read "comprises" rather than "encodes".

Dependent Claim 35 is objected because it depends on claims which were withdrawn. Applicant has amended Claim 35 to obviate this rejection.

The Examiner also states that the phrase "A seed produced by a transgenic plant" in Claim 38 is confusing because according to the Examiner, it is unclear whether the seed comprises the MAPK5 ortholog nucleic acid. Applicant has amended Claim 38 to by adding the phrase "wherein said seed comprises said nucleic acid encoding the MAPK5 ortholog".

2. The Claimed Invention is Enabled Under 35 U.S.C. § 112

The Examiner has objected to Claims 7-10, 26-27, 31, 35-36, 38, 42, 44 and 52-55, under 35 U.S.C. § 112, first paragraph, as failing to provide enablement for a transgenic plant with increased stress tolerance or a method of producing the transgenic plant comprising over-expression of any nucleic acid sequence encoding any MAPK5 or MAPK5 ortholog isolate from any source. Specifically, the Examiner maintains that undue experimentation would have been required by the

skilled artisan to determine how to use any MAPK5 ortholog from the grass family in obtaining stress tolerant transgenic plant.

Based on the present invention, one skilled in the art would know to screen for MAPK5 orthologs functionally similar to OsMAPK5 wherein the MAPK5 is expressed and possesses kinase activity. Specifically, the claimed invention provides guidance that OsMAPK5 activity is enhanced by cold temperatures of 4 °C and salt treatments (Examples 8.6 and 8.11) and provides methods for evaluating stress tolerance. Example 8.3 provides that the only OsMAPK5a possessed kinase activity suggesting the importance of the missing domain in OsMAPK5b. Further, the specification provides that the OsMAPK5 is induced by abscisic acid and wounding, (Example 8.5), induced by *M. grisea* infection (Example 8.4), over-expressed and suppressed in transgenic plants (Examples 8.7-8.8).

The Examiner maintains that undue experimentation by one skilled in the art is required to make use of expressing said polypeptide in a host cell other than bacteria or plant cells. Although, Applicant submits that one skilled in the art would be aware of the various techniques available to transform a MAPK5 ortholog into a prokaryotic or eukaryotic host cell, Applicant has amended the claims to recite host cells from bacterial or plant cells

Applicant has also amended independent Claims 27, 31 and 42 to recite MAPK5 ortholog comprising substantially the amino acid sequence of OsMAPK5 wherein the over-expression of the MAPK5 ortholog in the plant results in increased tolerance to abiotic stress compared to a wild-type plant wherein the abiotic stress consist of temperatures of 4 °C. In particular, the present invention provides guidance for exploiting routine experimentation using the characteristics of

OsMAPK5 to isolate a MAPK5 ortholog that comprises substantially the amino acid of OsMAPK5 and enhances tolerance to abiotic stress thereby enhancing tolerance in a transformed plant.

Accordingly, Applicant submits that the present invention is a novel method for enhancing tolerance to abiotic stress in a plant by transforming a plant with a MAPK5 nucleic acid sequence in the plant wherein a MAPK5 protein comprising substantially the amino acid sequence of OsMAPK5 is expressed in the plant, treating a plant with under abiotic stress conditions of 4 °C; isolating the MAPK5 protein from the plant detecting the MAPK5 activity and evaluating the increase or decrease in MAPK5 activity in the transformed plant whereby the increase in MAPK5 activity indicates the increase in tolerance to abiotic stress in the transformed plant compared to the wild-type plant. According, Applicant submits that the rejections have been obviated and respectfully that the rejection under 35 U.S.C. § 112 be withdrawn.

3. The Claimed Invention Complies with the Written Description Under 35 U.S.C. § 112

Claims 27, 31, 35, 36, 38, 42 and 44 have been rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. Specifically, the Examiner contends that the claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor, at the time the application was filed, had possession of the claimed invention. Applicant submits that independent Claims 27, 31 and 42 have been amended to recite a MAPK5 ortholog isolated from the *Graminaceae* family wherein the MAPK5 ortholog comprises substantially the amino acid sequence of OsMAPK5 wherein over-expression of the MAPK5 ortholog in the plant results in increased tolerance to abiotic stress compared to a wild-type plant

wherein the abiotic stress consist of temperatures of 4 °C. Accordingly, Applicant respectfully submits that the Examiner's rejection of Claims 27, 31, 35, 36, 38, 42 and 44 under 35 U.S.C. § 112, have been overcome and therefore respectfully request that the rejection be withdrawn.

4. The Claimed Invention is Patentable over Wen et al.

Claims 6-10 and 51-55 are rejected under 35 U.S.C. § 102(a), as unpatentable over Wen et al. (Plant Physiol., 129:1880-1891, 2002). The Examiner maintains that Wen anticipates the claimed invention. The rejection should be withdrawn for reasons detailed below.

Anticipation requires that all of the elements and limitations of a claim are found within a single prior art reference. There must be no difference between the claimed invention and the reference disclosure as viewed by a person of ordinary skill in the field of the invention. *Scripps Clinic & Research Foundation v. Genetech, Inc.*, 927 F.2d 1565, 1576 (Fed. Cir. 1991).

In response, Applicant has amended independent Claims 6, 7, 8, 51, 52 and 53 to recite an expression vector and genetically engineered host cell comprising the nucleotide sequence of SEQ. ID. NO: 1 operatively associated with a regulatory nucleotide sequence containing transcriptional and translational regulatory information that controls expression of the nucleotide sequence in a host cell wherein SEQ. ID. NO: 1 is expressed under abiotic stress conditions of 4 °C. Applicant submits that because Wen does not disclose an expression vector or a genetically engineered host cell comprising MAPK5 that is operatively associated with a regulatory nucleotide sequence containing transcriptional and translational regulatory information that controls expression of the nucleotide sequence in a host cell wherein

MAPK5 is expressed under abiotic stress conditions of 4 °C, Wen cannot anticipate the claimed invention.

In view of the foregoing, Applicant submits that the Examiner's rejection of Claims 6-10 and 51-55 under 35 U.S.C. § 102 have been overcome and therefore respectfully request that the rejection be withdrawn.

5. **The Claimed Invention is Not Obvious Under 35 U.S.C. § 103**

Claims 6-10, 26-28, 31-32, 35, 36, 38, 42 and 51-55 are rejected under 35 U.S.C. § 103, as being unpatentable over Wen et al. in view of Valvekens et al (1988 PNAS 85:5536-5549). Applicant respectfully submits that these rejections should be withdrawn for the reasons detailed.

Applicant submits that independent Claims 6-8, 27-28, 31-32, 42 and 51-53 have been amended thus making the rejection moot with respect these claims. The present invention provides methods for evaluating tolerance to abiotic stress in plants. Applicant respectfully emphasizes that there is no recognition or suggestion in any of the references of the invention which takes advantage of the fact that MAPK5 is induced by temperatures of 4 °C and salinity. Neither Wen nor Valvekens, even in combination, suggest or show an appreciation for an expression vector or genetic engineered host cell or transgenic plant comprising a MAPK5 ortholog operatively associated with a regulatory nucleotide sequence containing transcriptional and translational regulatory information that controls expression of the nucleotide sequence in a host cell wherein the MAPK5 ortholog is expressed under abiotic stress conditions of 4 °C. Nor does Wen or Valvekens suggest a method increasing abiotic stress in a plant by evaluating the increase or decrease

in MAPK5 activity of plants transformed with MAPK5 under abiotic stress conditions of 4 °C.

Rather, Wen teaches away from the present invention. In particular, Wen discloses that the mRNA levels of OsMEK1 and OsMAP1 were induced when seedlings were exposed to 12 °C but no induction when exposed to 4 °C or salt. There is no motivation by Wen to express a MAPK gene under abiotic conditions of low temperatures of 4 °C, because no benefit could be obtained for the purpose of the experiments described in Wen. Specifically, Wen does not teach a transformed plant cell or plant or a method of producing a transformed plant cell or plant under abiotic stress conditions of 4 °C. Moreover, Wen does not teach that expression of MAPK5 under cold conditions of 4 °C would enhance abiotic tolerance in plants. Thus, Applicant respectfully submits that the claimed invention is not obvious in view of the cited references.


In view of the foregoing, Applicant submits that the rejection is improper and should be withdrawn.

CONCLUSION

For all the reasons above, Applicant respectfully submits that all of the rejections based on 35 U.S.C. §112, §102 and §103 are in error or have been avoided and should be withdrawn. Applicant further submits that the present Claims 6-10, 26-28, 31, 32, 35, 36, 38, 42, 44 and 51-55 are in form for allowance and respectfully request early action to that end.

Respectfully submitted,

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